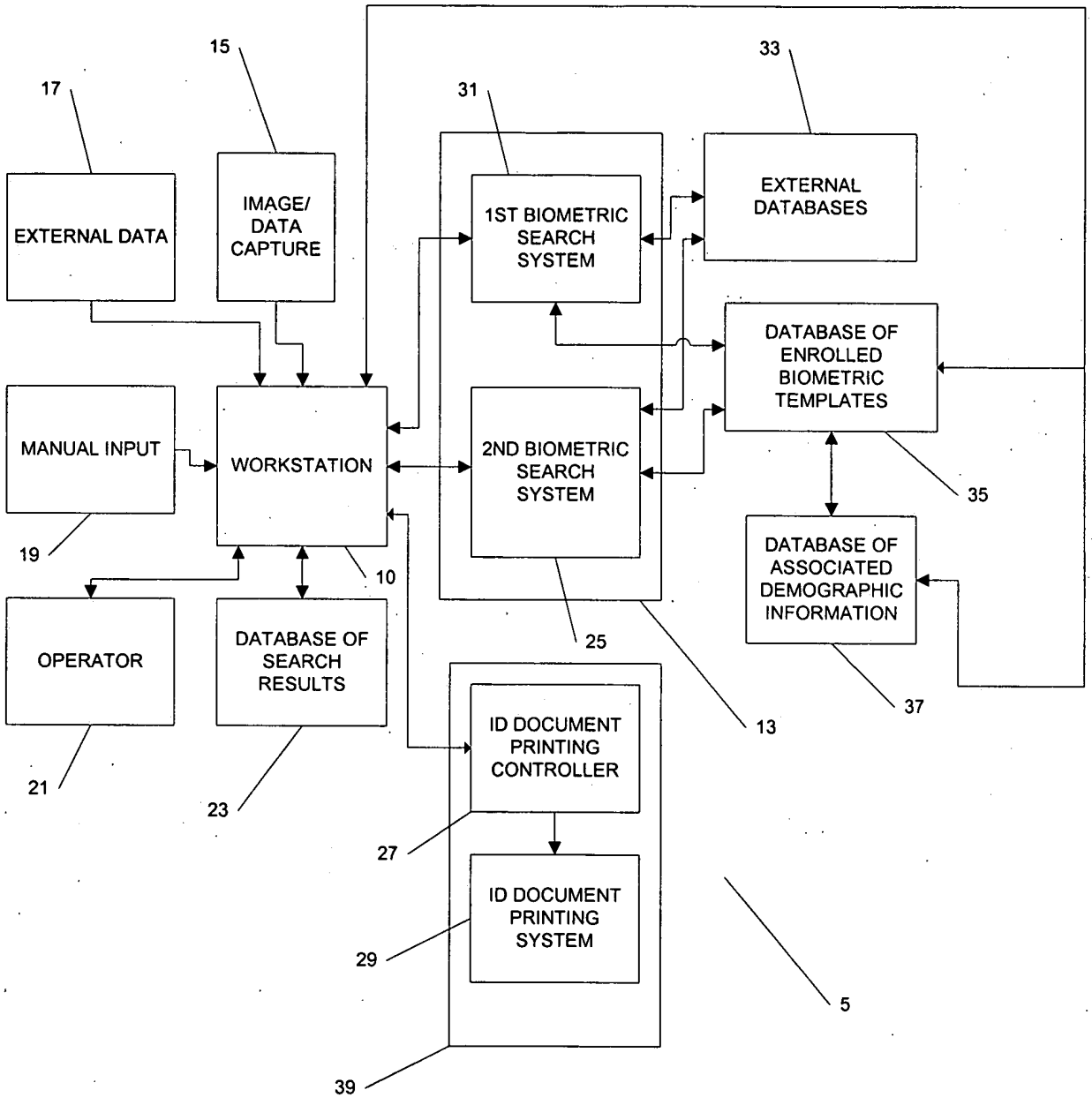

15
17
31
33
EXTERNAL DATA
IMAGE/ DATA CAPTURE
1ST BIOMETRIC SEARCH SYSTEM
EXTERNAL DATABASES
DATABASE OF ENROLLED BIOMETRIC TEMPLATES
MANUAL INPUT
WORKSTATION
2ND BIOMETRIC SEARCH SYSTEM
35
19
10
DATABASE OF ASSOCIATED DEMOGRAPHIC INFORMATION
OPERATOR
DATABASE OF SEARCH RESULTS
25
13
37
ID DOCUMENT PRINTING CONTROLLER
21
23
27
ID DOCUMENT PRINTING SYSTEM
29
5
39

FIG. 1

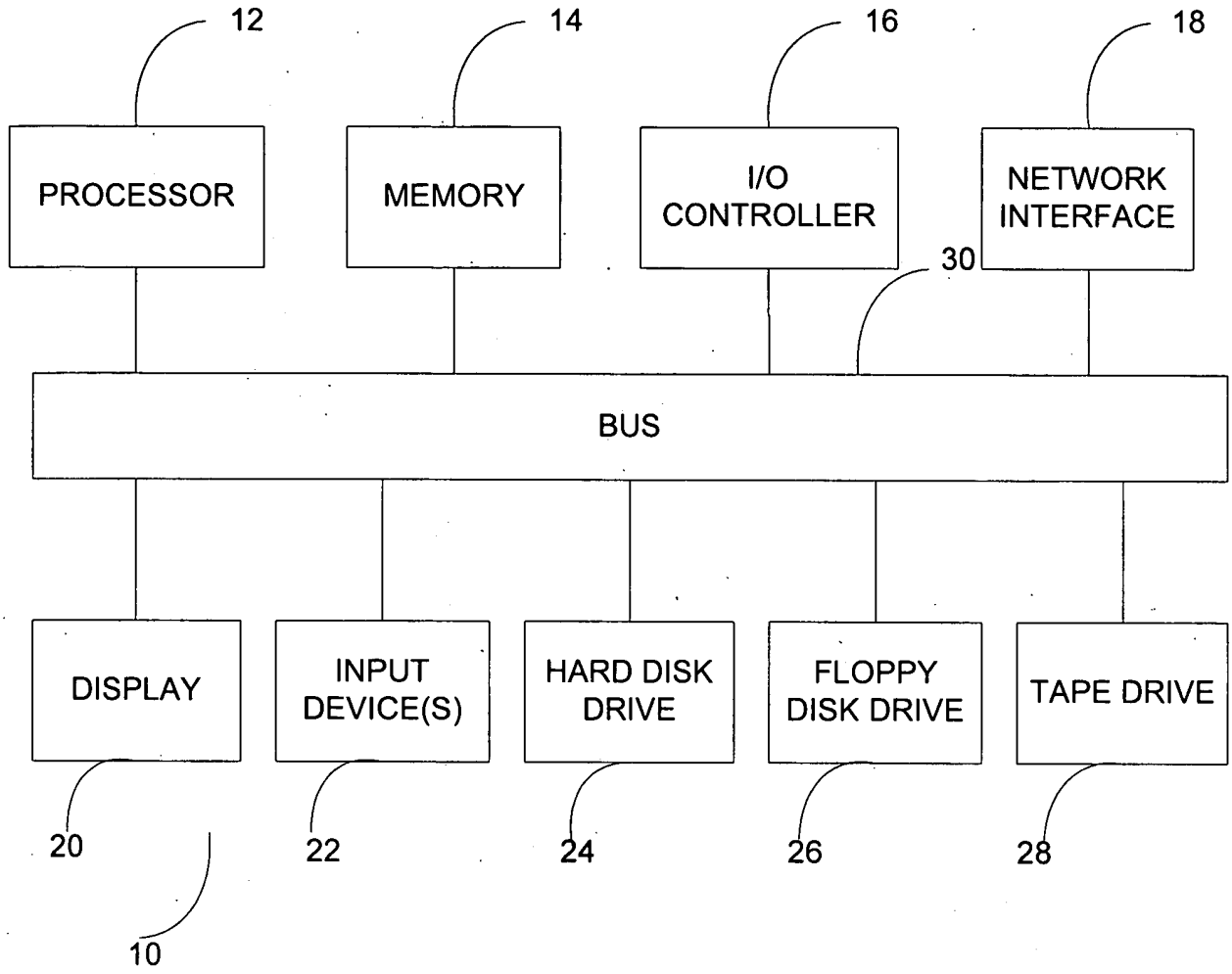

12
14
16
18
PROCESSOR
MEMORY
I/O CONTROLLER
NETWORK INTERFACE
30
BUS
DISPLAY
INPUT DEVICE(S)
HARD DISK DRIVE
FLOPPY DISK DRIVE
TAPE DRIVE
20
22
24
26
28
10

FIG. 2

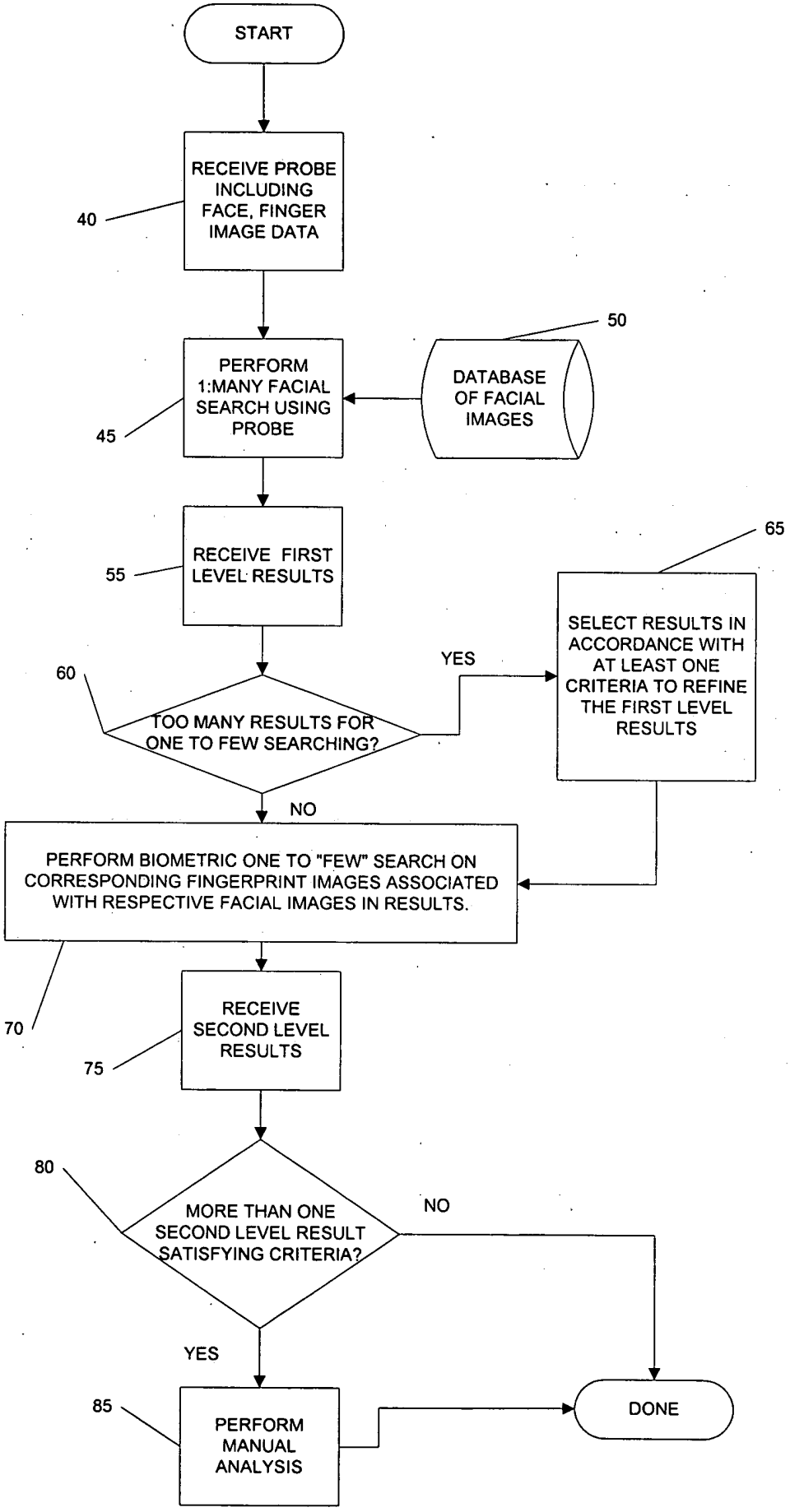
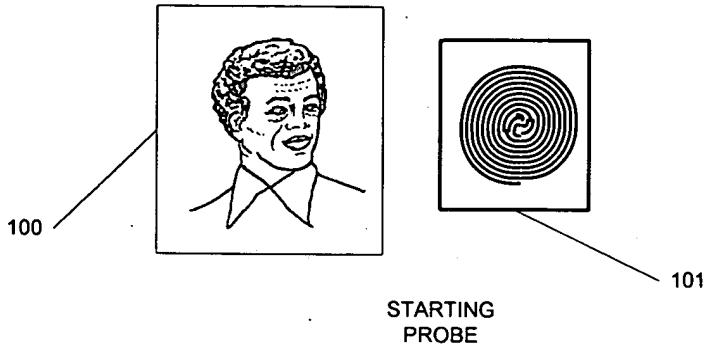
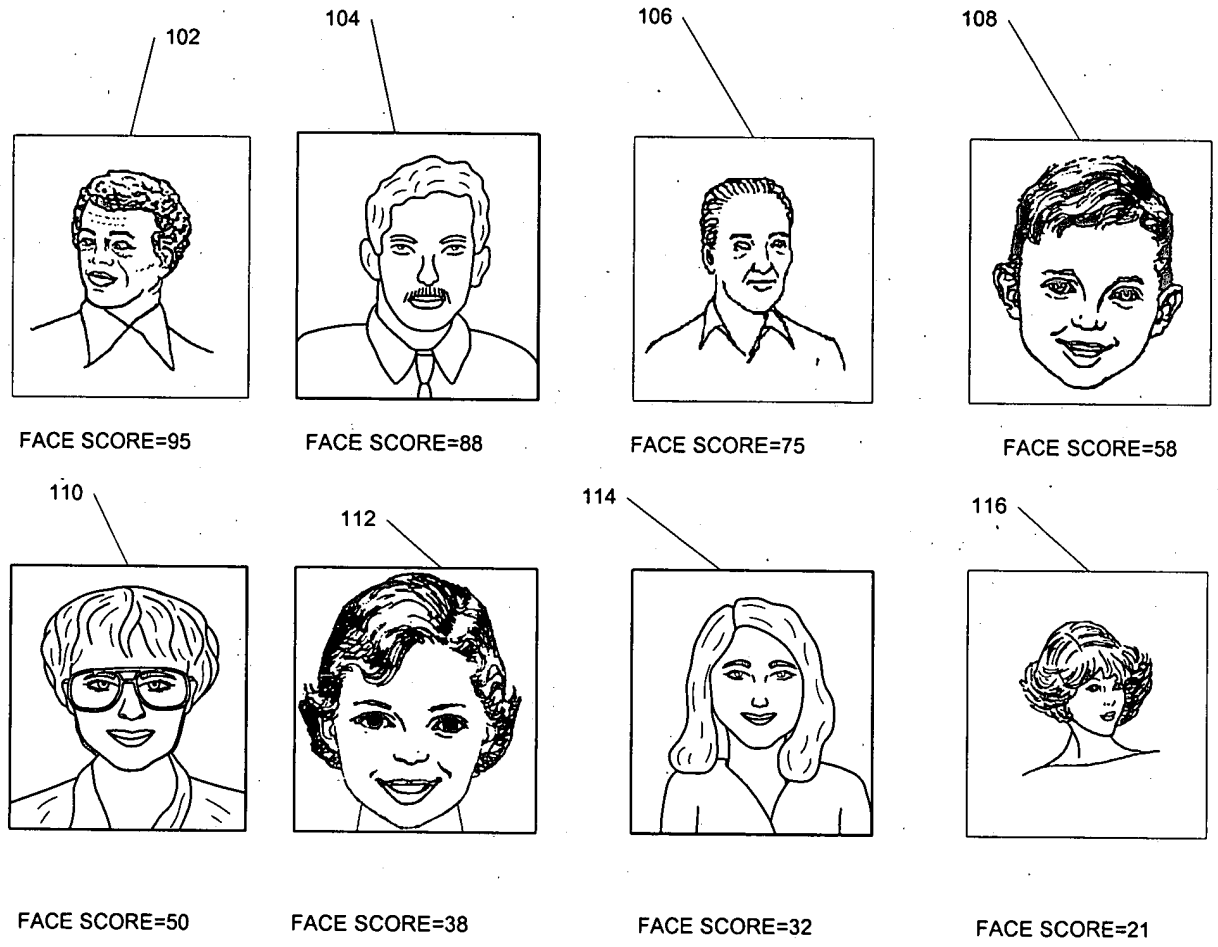

START
RECEIVE PROBE INCLUDING FACE, FINGER IMAGE DATA
40
PERFORM 1:MANY FACIAL SEARCH USING PROBE
45
DATABASE OF FACIAL IMAGES
50
RECEIVE FIRST LEVEL RESULTS
55
TOO MANY RESULTS FOR ONE TO FEW SEARCHING?
60
YES
SELECT RESULTS IN ACCORDANCE WITH AT LEAST ONE CRITERIA TO REFINE THE FIRST LEVEL RESULTS
65
NO
PERFORM BIOMETRIC ONE TO "FEW" SEARCH ON CORRESPONDING FINGERPRINT IMAGES ASSOCIATED WITH RESPECTIVE FACIAL IMAGES IN RESULTS.
70
RECEIVE SECOND LEVEL RESULTS
75
MORE THAN ONE SECOND LEVEL RESULT SATISFYING CRITERIA?
80
NO
YES
PERFORM MANUAL ANALYSIS
85
DONE

FIG.3


100
101
STARTING
PROBE

(A)


102
104
106
108
FACE SCORE=95
FACE SCORE=88
FACE SCORE=75
FACE SCORE=58
110
112
114
116
FACE SCORE=50
FACE SCORE=38
FACE SCORE=32
FACE SCORE=21

(B)

FIG. 4

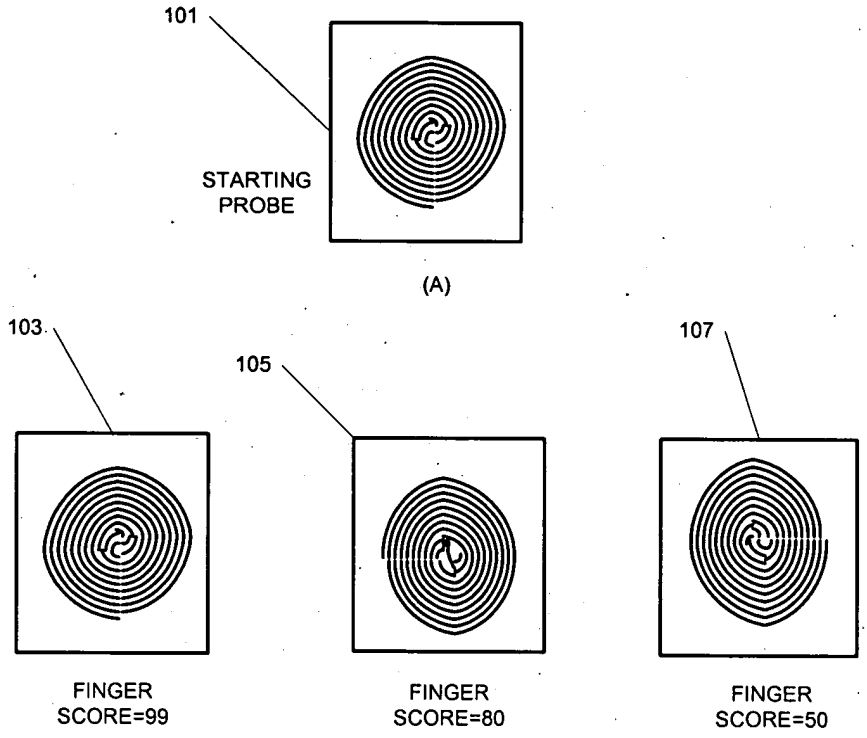

101
STARTING
PROBE
(A)
103
105
107
FINGER
SCORE=99
FINGER
SCORE=80
FINGER
SCORE=50
(B)

FIG. 5

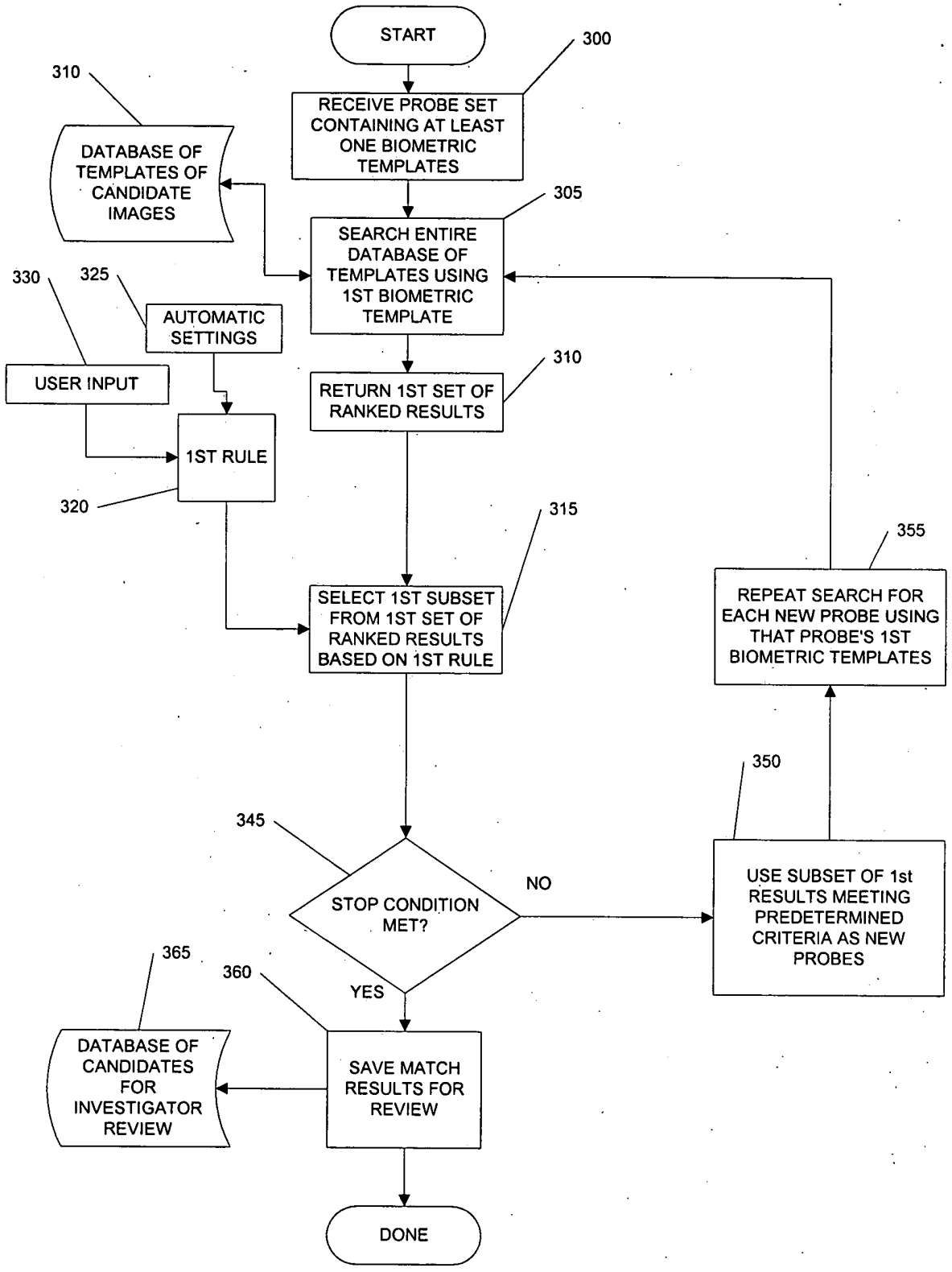

START
300
RECEIVE PROBE SET CONTAINING AT LEAST ONE BIOMETRIC TEMPLATES
310
DATABASE OF TEMPLATES OF CANDIDATE IMAGES
305
SEARCH ENTIRE DATABASE OF TEMPLATES USING 1ST BIOMETRIC TEMPLATE
330
325
AUTOMATIC SETTINGS
USER INPUT
310
RETURN 1ST SET OF RANKED RESULTS
1ST RULE
320
315
355
SELECT 1ST SUBSET FROM 1ST SET OF RANKED RESULTS BASED ON 1ST RULE
REPEAT SEARCH FOR EACH NEW PROBE USING THAT PROBE'S 1ST BIOMETRIC TEMPLATES
350
345
STOP CONDITION MET?
NO
USE SUBSET OF 1st RESULTS MEETING PREDETERMINED CRITERIA AS NEW PROBES
365
360
YES
DATABASE OF CANDIDATES FOR INVESTIGATOR REVIEW
SAVE MATCH RESULTS FOR REVIEW
DONE

FIG. 6

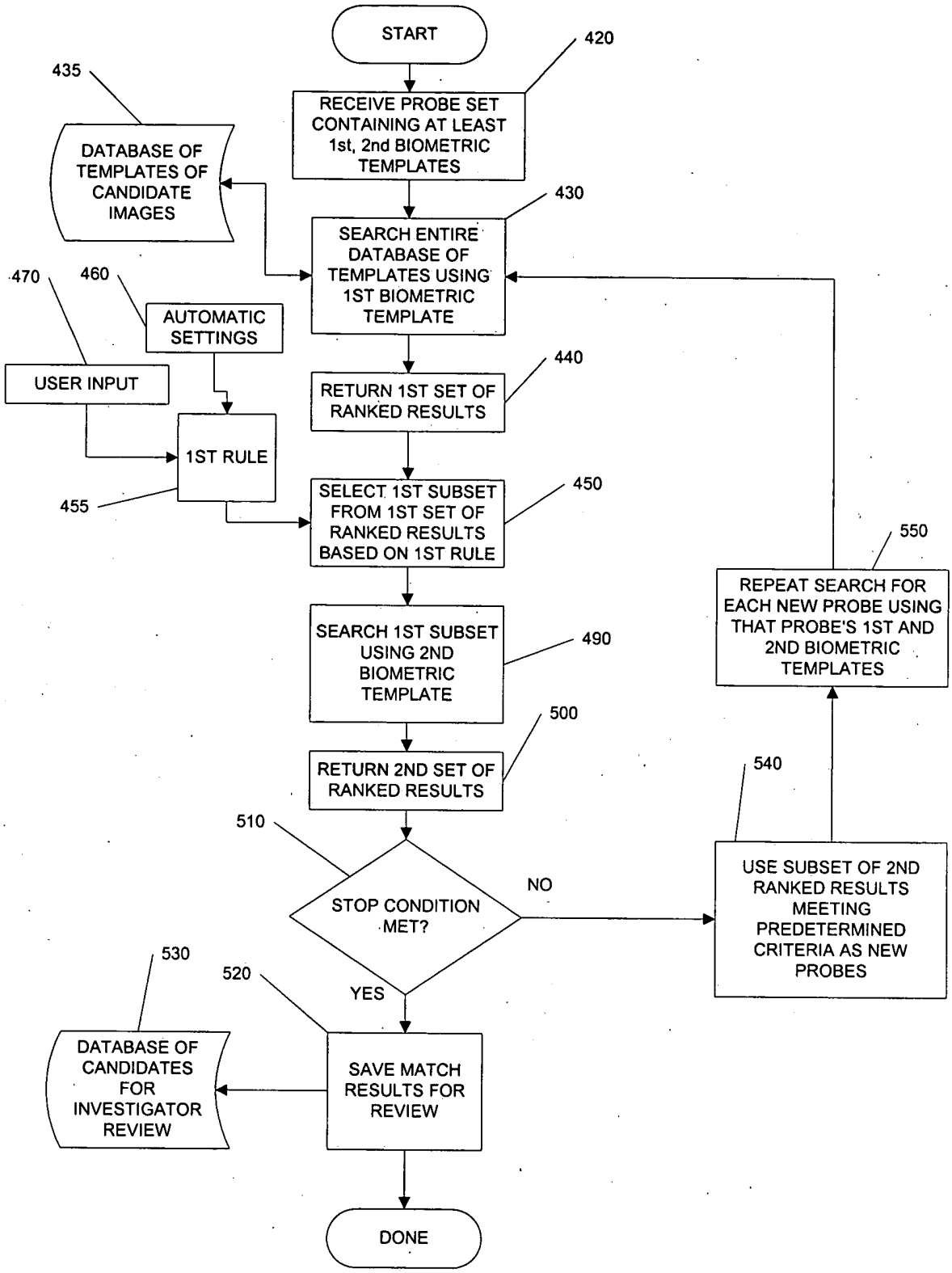
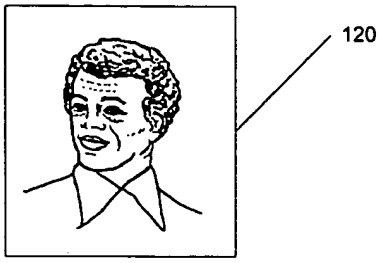
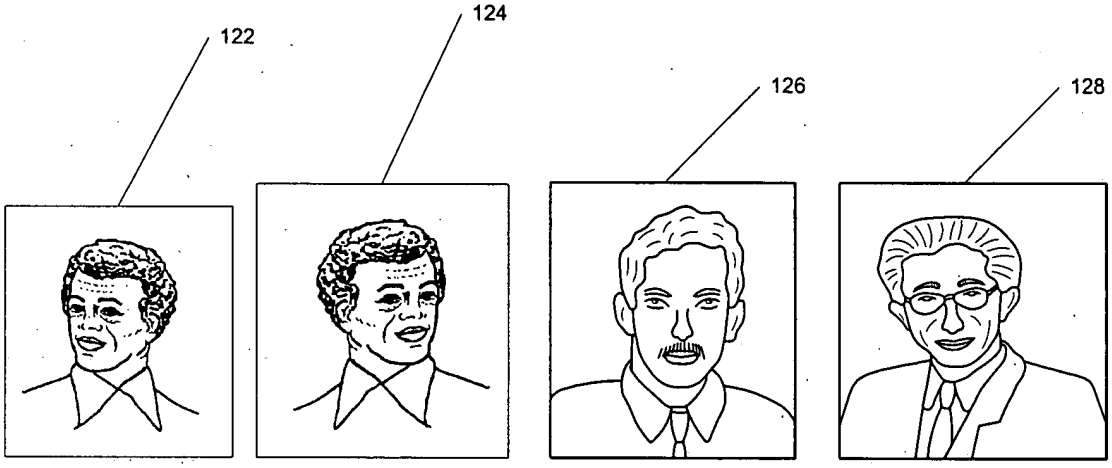

START
420
RECEIVE PROBE SET CONTAINING AT LEAST 1st, 2nd BIOMETRIC TEMPLATES
435
DATABASE OF TEMPLATES OF CANDIDATE IMAGES
430
SEARCH ENTIRE DATABASE OF TEMPLATES USING 1ST BIOMETRIC TEMPLATE
470
460
AUTOMATIC SETTINGS
USER INPUT
1ST RULE
455
440
RETURN 1ST SET OF RANKED RESULTS
450
SELECT 1ST SUBSET FROM 1ST SET OF RANKED RESULTS BASED ON 1ST RULE
490
SEARCH 1ST SUBSET USING 2ND BIOMETRIC TEMPLATE
500
RETURN 2ND SET OF RANKED RESULTS
510
STOP CONDITION MET?
NO
YES
540
USE SUBSET OF 2ND RANKED RESULTS MEETING PREDETERMINED CRITERIA AS NEW PROBES
550
REPEAT SEARCH FOR EACH NEW PROBE USING THAT PROBE'S 1ST AND 2ND BIOMETRIC TEMPLATES
530
520
DATABASE OF CANDIDATES FOR INVESTIGATOR REVIEW
SAVE MATCH RESULTS FOR REVIEW
DONE

FIG. 7



(A)



(B)

FIG. 8

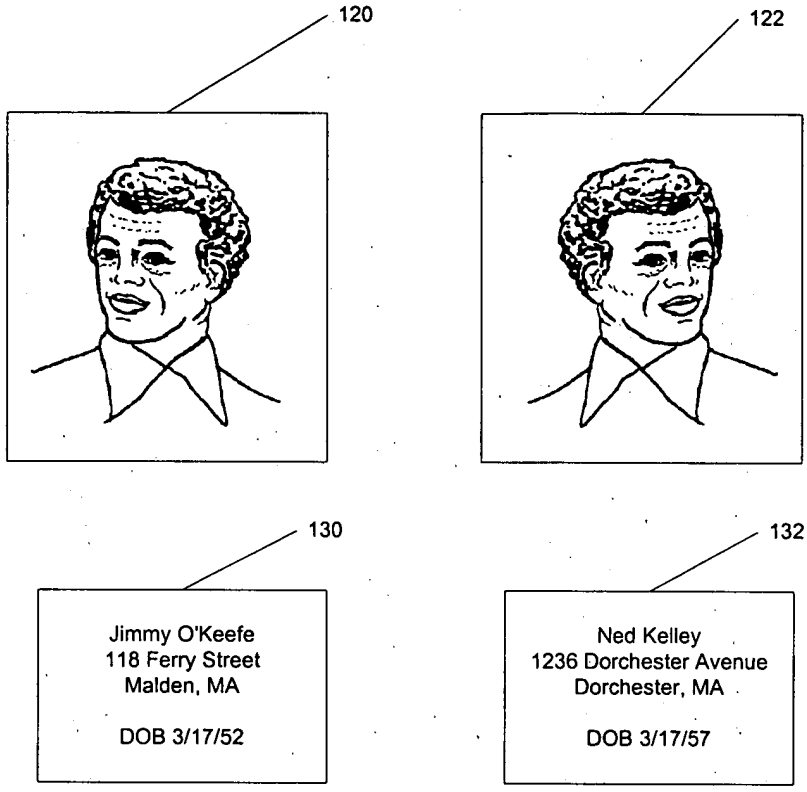

120
122
130
Jimmy O'Keefe
118 Ferry Street
Malden, MA
DOB 3/17/52
132
Ned Kelley
1236 Dorchester Avenue
Dorchester, MA
DOB 3/17/57
134
136
(A)
(B)

FIG. 9

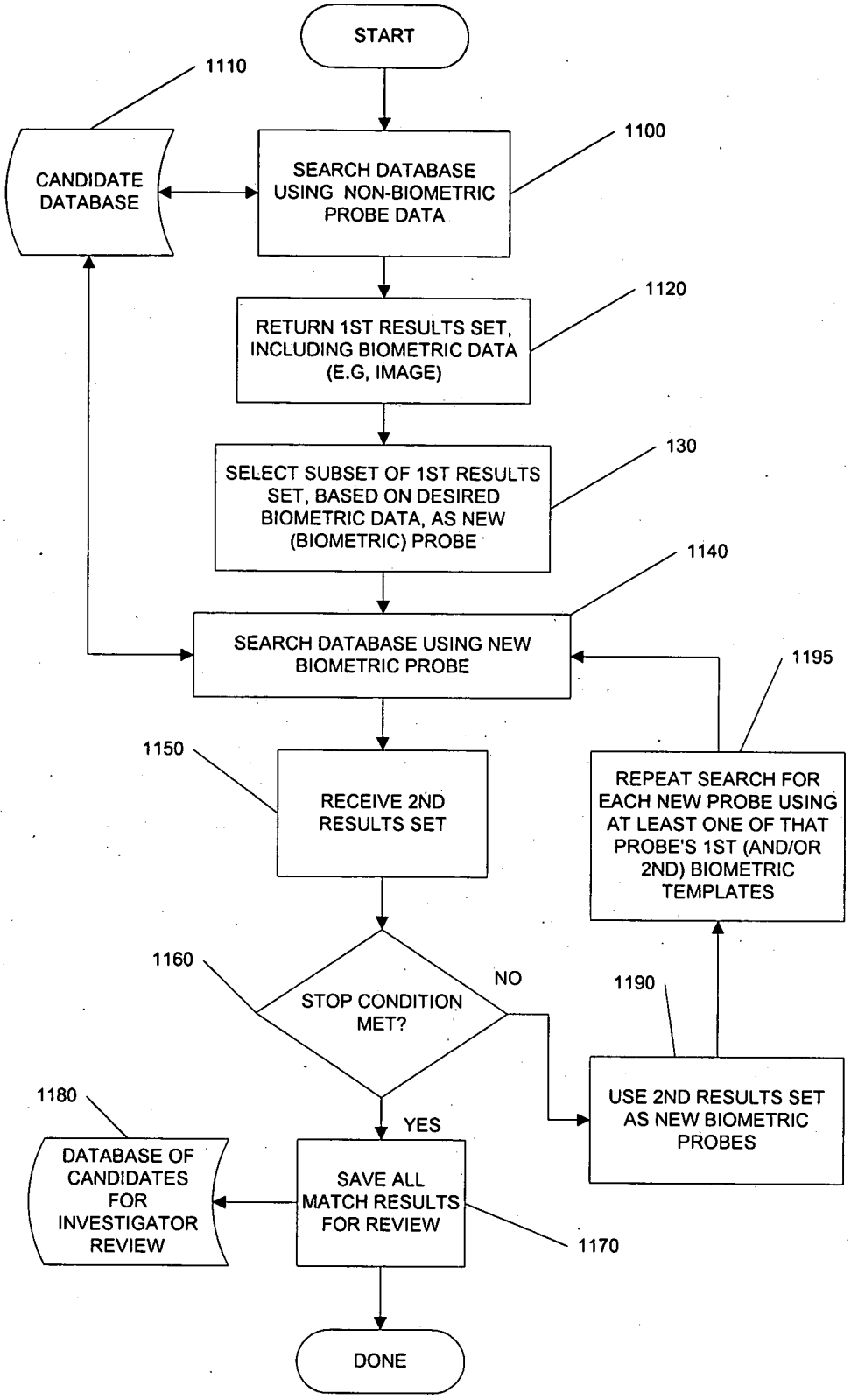

START
1110
CANDIDATE DATABASE
SEARCH DATABASE USING NON-BIOMETRIC PROBE DATA
1100
RETURN 1ST RESULTS SET, INCLUDING BIOMETRIC DATA (E.G, IMAGE)
1120
SELECT SUBSET OF 1ST RESULTS SET, BASED ON DESIRED BIOMETRIC DATA, AS NEW (BIOMETRIC) PROBE
130
SEARCH DATABASE USING NEW BIOMETRIC PROBE
1140
1195
1150
RECEIVE 2ND RESULTS SET
REPEAT SEARCH FOR EACH NEW PROBE USING AT LEAST ONE OF THAT PROBE'S 1ST (AND/OR 2ND) BIOMETRIC TEMPLATES
1160
STOP CONDITION MET?
NO
1190
YES
1180
USE 2ND RESULTS SET AS NEW BIOMETRIC PROBES
DATABASE OF CANDIDATES FOR INVESTIGATOR REVIEW
SAVE ALL MATCH RESULTS FOR REVIEW
1170
DONE

FIG. 10

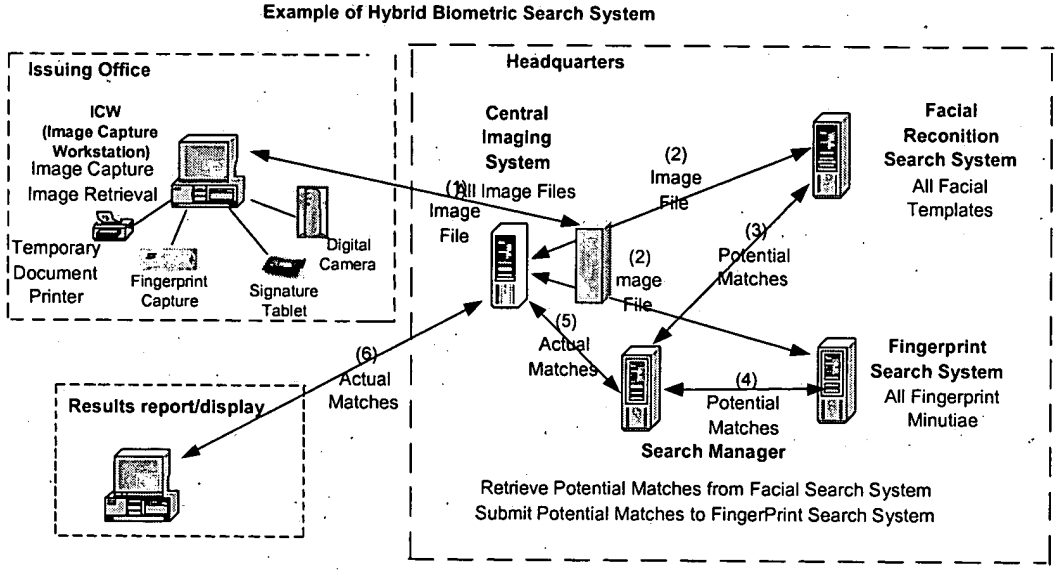

Example of Hybrid Biometric Search System
Issuing Office
ICW
(Image Capture Workstation)
Image Capture
Image Retrieval
Temporary Document Printer
Fingerprint Capture
Signature Tablet
Digital Camera
Results report/display
(6) Actual Matches
Headquarters
Central Imaging System
All Image Files
(1) Image File
(2) Image File
(2) mage File
(3) Potential Matches
(5) Actual Matches
(4) Potential Matches
Search Manager
Facial Reconition Search System
All Facial Templates
Fingerprint Search System
All Fingerprint Minutiae
Retrieve Potential Matches from Facial Search System
Submit Potential Matches to FingerPrint Search System

FIG. 11